

Amendments to the Drawings:

The attached replacement drawing sheet makes changes to Fig. 1 and replaces the original sheet with Fig. 1.

Attachment: Replacement Sheet (1)

REMARKS

Claims 1-3, 5, 6, 8-10 and 12-14 are pending in this application. By this Amendment, claims 1 and 9 are amended for clarity only. Fig. 1 also is amended. No new matter is added.

Entry of the amendments is proper under 37 CFR §1.116 since the amendments: (a) place the application in condition for allowance for the reasons discussed herein; (b) do not raise any new issue requiring further search and/or consideration as the amendments amplify issues previously discussed throughout prosecution; (c) satisfy a requirement of form asserted in the previous Office Action; and (d) place the application in better form for appeal, should an appeal be necessary. The amendments are necessary and were not earlier presented because they are made in response to arguments raised in the final rejection. Entry of the amendments is thus respectfully requested.

I. Objection to the Drawings

The Office Action objects to the drawings under 37 C.F.R. §1.83(a) because of certain features recited in claims 1, 6, 9 and 12. The objection is respectfully traversed. Fig. 1 is amended to show (1) that the clearance between the plain bearing and the output shaft is larger than a clearance between the rolling-contact bearings and the pinion shaft; and (2) that the coupling clearance between the external helical spline and the internal helical spline is larger than a clearance between the rolling-contact bearings and the pinion shaft, responsive to the objection. Thus, it is respectfully requested that the objection be withdrawn.

II. Objection to Claim 5

The Office Action objects to claim 5 because of an alleged informality. The objection is respectfully traversed. Applicants respectfully disagree with the Office Action that the claim 5 language is not correct. There is no grammatical error in the claim 5 feature reciting that an axial end of the rolling-contact bearings on a side of the motor is disposed adjacent to the one-way clutch. Thus, it is respectfully requested that the objection be withdrawn.

III. §112, Second Paragraph, Rejection of claims 1, 6, 9 and 12

The Office Action rejects claims 1, 6, 9 and 12 under 35 U.S.C. §112, second paragraph. The rejection is respectfully traversed.

Specifically, the Office Action alleges that the "clearance" features recited in claims 1, 6, 9 and 12 are indefinite because the specification fails to disclose a benefit of having one clearance larger than the other, and because the Examiner fails to understand the purpose of having one clearance larger than the other. However, contrary to the Office Action's assertion, benefits of the "clearance" features are described in the specification. For instance, a benefit of the clearance between the plain bearing and the output shaft being larger than a clearance between the rolling-contact bearings and the pinion shaft, as recited in claims 1 and 12, is found in the specification at, for example, page 10, lines 27-31.

Based on lines 27-31 and Fig. 1, for example, one skilled in the art would readily understand that when a bending moment acts on an action point of the pinion shaft 5 in response to a reaction force provided from the pinion gear 6 to the pinion shaft 5, the pinion shaft 5 inclines with respect to the bearings 14 by a maximum amount equivalent to the clearance between the bearings 14 and the pinion shaft 5. In such a case, if the clearance CB between the plain bearing 13 and the output shaft 4 is equal to or smaller than the clearance CA between the bearings 14 and the pinion shaft 5, the output shaft 4 not only collides with plain bearing 13, but also collides with the pinion shaft 5 at a collision point. When the pinion shaft 5 is rotated along a circumferential direction thereof, the action point is moved with the pinion shaft 5 along the circumferential direction, thereby moving the collision point along the circumferential direction. As a result, twist is caused between the pinion shaft 5 and the output shaft 4 that collide with each other at the collision point, and a friction loss at the collision point is generated during the rotation of the pinion shaft 5.

On the other hand, if the clearance CB is larger than the clearance CA, as recited in claims 1 and 12, no twist is caused between the inclined pinion shaft 5 and the output shaft 4 even if the pinion shaft 5 inclines with respect to the bearing 14 by the maximum amount equivalent to the clearance CA. As a result, the pinion shaft 5 rotates smoothly and it becomes possible to reduce driving loss.

A benefit of the coupling clearance between the external helical spline and the internal helical spline being larger than a clearance between the rolling-contact bearings and the pinion shaft, as recited in claims 6 and 9, is found in the specification at, for example, page 11, line 26 to page 12, line 3.

Based on Fig. 1 and page 11, line 26 to page 12, line 3, for example, one skilled in the art would readily understand that when a bending moment acts on an action point of the pinion shaft 5 in response to a reaction force provided from the pinion gear 6 to the pinion shaft 5, the pinion shaft 5 inclines with respect to the bearings 14. When the pinion shaft 5 inclines largely with respect to the bearings 14, the internal helical spline 7d also inclines largely with respect to the output shaft 4. In such a case, without placing any oil film of lube oil between the splines 7d, 4a, the internal helical spline 7d directly collides with the external helical spline 4a of the output shaft 4. As a result, the splines 4a and 7d can break. However, if the clearance CA between the bearings 14 and the pinion shaft 5 is limited, and the coupling clearance CC between the external helical spline 4a and the internal helical spline 7d is set to be larger than the clearance CA, even though the pinion shaft 5 inclines with respect to the bearings 14 by a maximum amount equivalent to the clearance CA, the external helical spline 4a does not collide with the internal helical spline 7d, and an oil film of lube oil is always held between the splines. Further, the required machining accuracy of the splines can be lowered so as to suppress manufacturing costs.

Thus, the "clearance" features recited in claims 1, 6, 9 and 12 are not indefinite, as alleged by the Office Action. The specification discloses the purposes of these features sufficiently to allow one skilled in the art to readily understand their benefits. Therefore, it is respectfully requested that the rejection be withdrawn.

IV. Rejection of the Claims

The Office Action rejects claims 1-3, 5, 6, 8-10 and 12-14 under 35 U.S.C. §103(a) over Isozumi I, U.S. Patent No. 5,370,009, in view of Isozumi II, U.S. Patent No. 4,923,229. The rejection is respectfully traversed.

The combination of Isozumi I and Isozumi II fails to disclose or suggest (1) that a clearance between the plain bearing and the output shaft is set to be larger than a clearance between the rolling-contact bearings and the pinion shaft, as recited in claim 1; and (2) that a coupling clearance between the external helical spline and the internal helical spline is set to be larger than a clearance between the rolling-contact bearings and the pinion shaft, as recited in claim 9.

The Office Action acknowledges that Isozumi I and Isozumi II each fails to disclose the claimed clearances in both (1) and (2), but asserts that modifying Isozumi II to provide the claimed clearances would have been obvious to one skilled in the art at the time of the invention. Specifically, with respect to (1), the Office Action alleges that one skilled in the art would have been motivated to provide the claimed clearances with the teaching of Isozumi II "for the purpose of allowing more lubricant to be present between the plain bearing and the output shaft to prevent wearing between the two members." However, the Office Action has not cited any evidence or support in Isozumi I, Isozumi II, or anywhere else that suggests that one skilled in the art would have been motivated to provide the starter of Isozumi II with the claimed clearances in (1). Although the Examiner proposes a benefit of incorporating the claimed clearances into the starter of Isozumi II, there is no evidence or support that Isozumi

II or Isozumi I (or any other source) recognizes any such benefit (or that such a benefit would actually occur). Thus, the Examiner has provided no evidence to support the conclusion that one skilled in the art would have been motivated to provide the claimed clearances in (1) with the starter of Isozumi II. Instead, the Office Action relies on impermissible hindsight using knowledge gleaned only from Applicants' disclosure (see MPEP §2145(X)(A)).

With respect to (2), the Office Action alleges that one skilled in the art would have been motivated to provide the claimed clearances with the teaching of Isozumi II "for the purpose of providing more clearance between the teeth of the helical spline to introduce limited backlash [sic] and other relative movement between members of the clutch." Again, however, the Office Action has not cited any evidence or support in Isozumi I, Isozumi II, or anywhere else that suggests that one skilled in the art would have been motivated to provide the starter of Isozumi II with the claimed clearances in (2). Although the Examiner proposes a benefit of incorporating the claimed clearances into the starter of Isozumi II, there is no evidence or support that Isozumi II or Isozumi I (or any other source) recognizes any such benefit (or that it actually would occur). Thus, the Examiner has provided no evidence to support the conclusion that one skilled in the art would have been motivated to provide the claimed clearances in (2) with the starter of Isozumi II. Instead, the Office Action relies on impermissible hindsight using knowledge gleaned only from Applicants' disclosure (see MPEP §2145(X)(A)).

Thus, it would not have been obvious to one skilled in the art to provide the claimed clearances in (1) and (2) with the starter of Isozumi II based on the teachings of either Isozumi II and Isozumi I. Therefore, claims 1 and 9 are patentable over the combination of Isozumi I and Isozumi II.

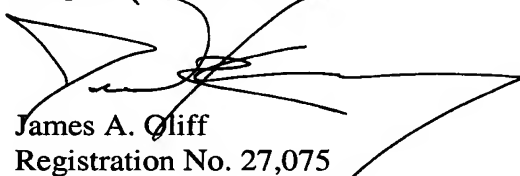
Because claims 2, 3, 5, 6, 8, 10 and 12-14 incorporate the features of claims 1 and 9, these claims also are patentable over the combination of Isozumi I and Isozumi II. Thus, it is respectfully requested that the rejection be withdrawn.

V. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of all pending claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachment:
Replacement Sheet (1)

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